said modulator operable to divide said m signal points into g signal point groups, assign the g values of the first data stream to the g signal point groups respectively, assign data of the second data stream to signal points of each of the g signal point groups, and select the signal points in the vector space diagram according to said input signal, so that:

said m signal points are distinguishable from one another in the vector space diagram by means of a first set of thresholds dividing the vector space diagram into m regions, and the g signal point groups are distinguishable from one another in the vector space diagram by means of a second set of thresholds dividing the vector space diagram more coarsely than the first set of thresholds into g regions,

signal points in each of said signal point groups are allocated in the vector space diagram at equal intervals,

a distance in the vector space diagram between any closest two signal points of any adjacent two signal point groups is $2\delta \times n$, and a distance in the vector space diagram between any closest two signal points in each signal point group is less than $2\delta$, where n is a shift value which is more than 1 and $2\delta$ represents a distance in the vector space diagram between any adjacent two signal points of the m signal points when the m signal points are allocated in the vector space diagram at equal intervals in the I axis and Q axis directions of the vector space diagram.

B1 Cont

23. A signal transmission apparatus of claim 22,

wherein the second set of thresholds are the I and Q axis of the vector space diagram.

24. A signal receiving apparatus comprising:

- a demodulator operable to demodulate a received signal to obtain a reconstructed data,

said received signal having symbols, each of which is representing one of m signal points in a vector space diagram, where m is an integer number and the vector space diagram includes an I axis and a Q axis extending in directions perpendicular to each other, the m signal points being divided into g signal point groups each containing m/g signal points, where g is an integer number, and

said reconstructed data containing a first data stream including g values of bit patterns which are assigned to the g signal point groups and a second data stream including m/g values of bit patterns which are assigned to the m/g signal points of each of the g signal point groups;

said demodulator operable to distinguish the m/g signal points in each of the g signal point groups by a first set of thresholds and reconstruct data of the second data stream corresponding to values of the distinguished m/g signal points in each of the g signal point groups and operable to distinguish the g signal point groups from one another by a second set of thresholds and reconstruct data of the first data stream corresponding to values of the distinguished g signal point groups; wherein:

said m signal points are distinguishable from one another in the vector space diagram by means of the first set of thresholds dividing the vector space diagram into m regions, and the g signal point groups are distinguishable from one another in the vector space diagram by means of the second set of thresholds dividing the vector space diagram more coarsely than the first set of thresholds into g regions,

B1 cont

signal points in each of said signal point groups are allocated in the vector space diagram at equal intervals;

a distance in the vector space diagram between any closest two signal points of any adjacent two signal point groups is $2\delta \times n$, and a distance in the vector space diagram between any closest two signal points in each signal point group is less than $2\delta$, where n is a shift value which is more than 1 and $2\delta$ represents a distance in the vector space diagram between any adjacent two signal points when the m signal points are allocated in the vector space diagram at equal intervals in the I axis and Q axis directions of the vector space diagram.

25. A signal receiving apparatus of claim 24,

wherein the second set of thresholds are the I and Q axis of the vector space diagram.

26. A signal transmission method comprising:

- modulating a carrier wave with an input signal to produce a modulated signal, and

- transmitting the modulated signal,

said input signal containing a first data stream including g values of bit patterns and a second data stream, where g is an integer number, and

the modulated signal having symbols, each of which is representing one of m signal points in a vector space diagram, where m is an integer number and the vector space diagram includes an I axis and a Q axis extending in directions perpendicular to each other,

said modulating including dividing said m signal points into g signal point groups, assigning the g values of the first data stream to the g signal point groups respectively, assigning data of the second data stream to signal points of each of the g signal point groups, selecting the signal points in the vector space diagram according to said input signal, so that:

said m signal points are distinguishable from one another in the vector space diagram by a first set of thresholds dividing the vector space diagram into m regions, and the g signal point groups are distinguishable from one another in the vector space diagram by a second set of thresholds dividing the vector space diagram more coarsely than the first set of thresholds into g regions,

signal points in each of said signal point groups are allocated in the vector space diagram at equal intervals,

a distance in the vector space diagram between any closest two signal points of any adjacent two signal point groups is $2\delta \times n$, and a distance in the vector space diagram between any closest two signal points in each signal point group is less than $2\delta$, where n is a shift value which is more than 1 and $2\delta$ represents a distance in the vector space diagram between any adjacent two signal points when the m signal points are allocated in the vector space diagram at equal intervals in the I axis and Q axis directions of the vector space diagram.

27. A signal transmission method of claim 26,

wherein the second set of thresholds are the I and Q axis of the vector space diagram.

28. A signal receiving method comprising:

- demodulating a received signal to obtain reconstructed data,

said received signal having symbols, each of which is representing one of m signal points in a vector space diagram, where m is an integer number and the vector space diagram includes an I axis and a Q axis extending in directions perpendicular to each other, the m signal points being divided into g signal point groups each containing m/g signal points, where g is an integer number, and

said reconstructed data containing a first data stream including g values of bit patterns which are assigned to the g signal point groups and a second data stream including m/g values of bit patterns which are assigned to the m/g signal points of each of the g signal point groups;

said demodulating including distinguishing the m/g signal points in each of the g signal point groups by a first set of thresholds and for reconstructing data of the second data stream corresponding to values of the distinguished m/g signal points in each of the g signal point groups and distinguishing the g signal point groups from one another by a second set of thresholds and for reconstructing data of the first data stream corresponding to values of the distinguished g signal point groups; wherein:

B1 CONT

said m signal points are distinguishable from one another in the vector space diagram by the first set of thresholds dividing the vector space diagram into m regions, and the g signal point groups are distinguishable from one another in the vector space diagram by the second set of thresholds dividing the vector space diagram more coarsely than the first set of thresholds into g regions,

signal points in each of said signal point groups are allocated in the vector space diagram at equal intervals;

a distance in the vector space diagram between any closest two signal points of any adjacent two signal point groups is $2\delta \times n$, and a distance in the vector space diagram between any closest two signal points in each signal point group is less than $2\delta$, where n is a shift value which is more than 1 and $2\delta$ represents a distance in the vector space diagram between any adjacent two signal points when the m signal points are allocated in the vector space diagram at equal intervals in the I axis and Q axis directions of the vector space diagram.

B1 Cont'd

29. A signal receiving method of claim 28,

wherein the second set of thresholds are the I and Q axis of the vector space diagram.